

PLANT BIOLOGY PLB

**Department of Plant Biology
College of Natural Science**

105 Plant Biology

Fall, Spring. 3(3-0) SA: BOT 105
Plant structure, function, development, genetics, diversity and ecology.

106 Plant Biology Laboratory

Fall, Spring. 1(0-3) P: PLB 105 or concurrently SA: BOT 106
Cell structure, anatomy, physiology, growth and development, and diversity of plants.

162 Organismal and Population Biology

Fall, Spring, Summer. 3(3-0) Interdepartmental with Biological Science and Zoology. Administered by Biological Science. P: BS 161 or BS 181H or LB 145 SA: BS 110, BS 148H Not open to students with credit in BS 182H or LB 144.

Biological diversity and organismal biology. Principles of evolution, transmission genetics, population biology, community structure, ecology.

172 Organismal and Population Biology Laboratory

Fall, Spring, Summer. 2(1-3) Interdepartmental with Biological Science and Zoology. Administered by Biological Science. P: (BS 162 or concurrently) or (BS 182H or concurrently) SA: BS 110, BS 158H Not open to students with credit in BS 192H or LB 144.

Nature and process of organismal biology including experimental design, statistical methods, hypothesis testing in genetics, ecology, and evolution.

182H Honors Organismal and Population Biology

Fall. 3(3-0) Interdepartmental with Biological Science and Lyman Briggs and Zoology. Administered by Biological Science. P: BS 181H SA: BS 148H, BS 110 Not open to students with credit in BS 162 or LB 144.

Diversity and basic properties of organisms, with emphasis on genetic principles, ecological interactions, and the evolutionary process. Historical approach to knowledge discovery.

192H Honors Organismal and Population Biology Laboratory

Fall. 2(1-3) Interdepartmental with Biological Science and Lyman Briggs and Zoology. Administered by Biological Science. P: BS 182H or concurrently SA: BS 158H, BS 110 Not open to students with credit in BS 172 or LB 144.

Nature and process of organismal biology, including experimental design and statistical methods, hypothesis testing, genetics, ecology, and evolution.

203 Biology of Plants

Fall. 3(3-0) P: (BS 162 or concurrently) or (LB 144 or concurrently) or (BS 182H or concurrently)

Evolution and diversification of plants. Structural innovations and physiological attributes of vascular land plants.

218 Plants of Michigan

Fall. 3(2-2) P: BS 162 or PLB 105 or LB 144 or BS 182H SA: BOT 218

Plant taxa of Michigan and the Great Lakes region and the major habitats in which they occur. Principles and rationale of classification. Relationships between life histories, morphology and environment.

301 Introductory Plant Physiology

Fall. 3(3-0) P: (CEM 141 or CEM 151 or LB 171 or CEM 181H) and ((PLB 105 or BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement) SA: BOT 301

General principles of plant physiology relating plant structure to function. Cell physiology, water relations, effects of light and temperature, respiration, photosynthesis, mineral nutrition, and hormone action.

316 Experiments in Plant Biology

Spring. 4(2-5) P: ((CEM 142 or concurrently) and (CEM 161 or concurrently) and (CEM 251 or concurrently)) or ((CEM 152 or concurrently) and (CEM 161 or concurrently) and (CEM 251 or concurrently) and PLB 203) and completion of Tier I writing requirement)

Exploration of fundamental topics in plant biology using modern techniques for studies at the molecular and ecological levels.

319 Introduction to Earth System Science

Fall. 3(3-0) Interdepartmental with Entomology and Geological Sciences and Sociology and Zoology. Administered by Entomology. RB: Completion of one course in biological or physical science.

Systems approach to Earth as an integration of geochemical, geophysical, biological and social components. Global dynamics at a variety of spatio-temporal scales. Sustainability of the Earth system.

335 Plants Through Time

Spring of odd years. 3(3-0) Interdepartmental with Geological Sciences. Administered by Plant Biology. P: BS 162 or PLB 105 or GLG 201 or LB 144 or BS 182H R: Open to juniors or seniors. SA: BOT 335

Evolutionary history of plants, development of ecosystems, and use of plant fossils in the reconstruction of ancient environments and climate.

341 Fundamental Genetics

Fall, Spring, Summer. 4(4-0) Interdepartmental with Zoology. Administered by Zoology. P: BS 161 or LB 145 or BS 181H

Principles of heredity in animals, plants and microorganisms. Classical and molecular methods in the study of gene structure, transmission, expression and evolution.

355 Ecology

Fall, Spring, Summer. 3(3-0) Interdepartmental with Zoology. Administered by Zoology. P: BS 162 or LB 144 or BS 182H SA: ZOL 250

Plant and animal ecology. Interrelationships of plants and animals with the environment. Principles of population, community, and ecosystem ecology. Application of ecological principles to global sustainability.

355L Ecology Laboratory (W)

Fall, Spring, Summer. 1(0-3) Interdepartmental with Zoology. Administered by Zoology. P: (ZOL 355 or concurrently) or completion of Tier I writing requirement

Population, community, and ecosystem ecology, utilizing plant and animal examples to demonstrate general field principles.

400 Introduction to Bioinformatics

Spring of odd years. 3(2-2) Interdepartmental with Biochemistry and Molecular Biology and Microbiology and Molecular Genetics. Administered by Plant Biology. P: (STT 200 or STT 201 or STT 231 or STT 421) and (PLB 203 or MMG 201 or BMB 200) RB: An introductory biology course covering basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and basic probability theory is recommended for biology majors.

Bioinformatic theory and practice. How to manage and analyze sequences, structures, gene expression, and other types of biological data.

402 Biology of Fungi

Fall of odd years. 3(2-3) Interdepartmental with Plant Pathology. Administered by Plant Biology. P: BS 162 or BS 161 or PLB 105 or LB 145 or BS 182H or BS 181H SA: BOT 402

Characteristics, habitats, and diversity of major groups of fungi. Ecologic and economic importance of fungi.

407 Diseases and Insects of Forest and Shade Trees

Spring. 4(3-3) Interdepartmental with Entomology and Plant Pathology. Administered by Plant Pathology. P: (PLB 105 or BS 162 or LB 144) and Completion of Tier I Writing Requirement SA: BOT 407

Diseases, insects, and environmental problems affecting trees in forests, parks, suburbs, and nurseries. Methods of control.

415 Plant Physiology

Spring. 3(3-0) P: (CEM 143 or CEM 251 or CEM 351) and (BS 161 or LB 145 or BS 181H) SA: PLB 414

Principles of plant metabolism, growth, and development. Photosynthesis, water relations, nitrogen metabolism, and cell wall biosynthesis. Environmental and hormonal factors that control plant growth and development. Gene regulation and genetic engineering of plants.

416L Plant Physiology Laboratory

Spring. 1(0-3) P: (CEM 143 or CEM 351 or CEM 251) and (BS 161 or LB 145 or BS 181H) and (PLB 415 or concurrently)

Experimental methods and experiment design in plant physiology and molecular biology, with emphasis in photosynthesis, water relations, plant growth, plant development, genetics and gene regulation. Communication of scientific information in written and graphical format.

418 Plant Systematics

Spring, Summer. 3(2-3) P: PLB 105 or BS 162 or LB 144 or BS 182H SA: BOT 418

Classification and evolution of higher plants, with emphasis on identification, characteristics of plant families, and systematic theory and practice.

424 Algal Biology

Fall of even years, Summer of odd years. 4(2-4) Interdepartmental with Zoology. Administered by Plant Biology. P: (BS 162 or LB 144 or BS 182H) and (BS 172 and completion of Tier I writing requirement) RB: ZOL 355 and ZOL 355L SA: BOT 424

Algal taxonomy, systematics, physiology, ecology, and environmental assessment. Lab focus on identification of freshwater algal genera collected from regional habitats.

Plant Biology—PLB

- 434 Plant Structure and Function**
Spring of odd years. 4(2-4) P: (BS 161 and BS 162) or (LB 144 and LB 145) or (BS 181H and BS 182H) SA: BOT 434
Plant anatomy from a structural and functional perspective. Physiological, developmental, and ecological significance of cell types, tissue types, and meristems of vegetative and reproductive plant parts.
- 440 Field Ecology and Evolution**
Summer. 4 credits. Interdepartmental with Zoology. Administered by Zoology. P: ZOL 355
Solving conceptual and practical research problems in ecology and evolution under field conditions.
- 441 Plant Ecology**
Fall. 3(3-0) P: (BS 162 or LB 144 or PLB 105 or ZOL 355 or BS 182H) and completion of Tier I writing requirement SA: BOT 441
Ecology of plants and their communities. Effects of biotic and climatological factors influencing global distribution of plant communities. Community structure and function, microclimatology, ecophysiology, and adaptation.
- 443 Restoration Ecology**
Spring. 3(2-2) Interdepartmental with Biosystems Engineering and Fisheries and Wildlife and Zoology. Administered by Fisheries and Wildlife. RB: (CSS 210 or BE 230) and (FOR 404 or FW 364 or ZOL 355)
Principles of ecological restoration of disturbed or damaged ecosystems. Design, implementation, and presentation of restoration plans. Field trips required.
- 445 Evolution (W)**
Fall. 3(3-0) Interdepartmental with Crop and Soil Sciences and Zoology. Administered by Zoology. P: (ZOL 341 or CSS 350) and completion of Tier I writing requirement R: Not open to freshmen. SA: ZOL 345
Processes of evolutionary change in animals, plants, microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.
- 485 Tropical Biology**
Spring. 3(3-0) Interdepartmental with Entomology and Zoology. Administered by Zoology. P: ZOL 355 R: Open only to juniors or seniors.
Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.
- 490 Directed Studies**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: Completion of Tier I writing requirement. RB: One year of college biology. R: Approval of department. SA: BOT 490
Directed study of published literature in an area of plant biology.
- 490H Honors Directed Studies**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: Completion of Tier I writing requirement. RB: One year of college biology. R: Approval of department. SA: BOT 490H
Directed study of published literature in an area of plant biology.
- 495 Botanical Garden Internship**
Fall, Spring, Summer. 2 to 8 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department. SA: BOT 495
Activities, functions and organization of botanical gardens. Principles of live plant curation.
- 498 Undergraduate Research**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. P: (BS 161 and BS 162 and BS 171 and BS 172) or (LB 144 and LB 145) or ((BS 181H and BS 182H and BS 191H and BS 192H) and completion of Tier I writing requirement) R: Approval of department. SA: BOT 498
Laboratory and/or field research in an area of plant biology.
- 499 Senior Seminar**
Spring. 2(2-0) A student may earn a maximum of 4 credits in all enrollments for this course. P: (PLB 498) and completion of Tier I writing requirement SA: BOT 499
A capstone experience that focuses on current developments and issues in plant biology. Scientific writing and oral presentation.
- 800 Seminar in Plant Biology**
Fall. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to graduate students. SA: BOT 800
Current research and approaches in plant biology.
- 802 Selected Topics in Plant Biology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 802
Recent developments in plant biology.
- 803 Integrative Topics in Plant Biology**
Spring of even years. 1 to 2 credits. A student may earn a maximum of 4 credits in all enrollments for this course.
Integrative topics in plant biology. Molecular, physiological, ecological, and evolutionary perspectives. Proposal writing and presentation.
- 805 Special Problems in Physiology and Biochemistry**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 805
Faculty directed individualized study of a selected problem.
- 806 Special Problems in Genetics and Molecular Biology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 806
Faculty directed individualized study of a selected problem.
- 807 Special Problems in Mycology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 807
Faculty directed individualized study of a selected problem.
- 809 Special Problems in Ecology, Systematics, and Evolution**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 809
Faculty directed individualized study of a selected problem.
- 810 Theories and Practices in Bioinformatics**
Spring of odd years. 3(2-2) Interdepartmental with Biochemistry and Molecular Biology and Microbiology and Molecular Genetics. Administered by Plant Biology. RB: Basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and basic probability theory is recommended for biology majors.
Theories and algorithms behind bioinformatics tools. Basic tool development by writing scripts in the Python programming language for data analysis.
- 812 Principles and Applications of Plant Genomics**
Fall. 3(2-2) RB: Undergraduate genetics course and one undergraduate course of Biochemistry, cell biology or molecular biology R: Open to graduate students.
Foundations, principles, and applications of genome sequencing, genome analysis, expression profiling, and systems biology with respect to plant biology.
- 820 Plant Reproductive Biology and Polyploidy**
Spring of odd years. 1(3-0) Interdepartmental with Crop and Soil Sciences and Forestry and Horticulture and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology
Genetic processes underlying variations in plant reproductive biology and polyploidy. Utilization of these characteristics in plant breeding.
- 821 Crop Evolution**
Spring of odd years. 1 credit. Interdepartmental with Crop and Soil Sciences and Forestry and Horticulture and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology
Cultural and biological aspects of the evolution of domestic plants.
- 822 Historical Geography of Crop Plants**
Spring of odd years. 1 credit. Interdepartmental with Crop and Soil Sciences and Forestry and Horticulture and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology
Development and spread of the major crop species.

- 826 Tropical Biology: An Ecological Approach**
 Spring, Summer. 8 credits. Interdepartmental with Zoology. Administered by Plant Biology. R: Approval of department; application required. SA: BOT 826
 Principles of tropical ecology at the population, community, and ecosystem levels. Given at various sites in Costa Rica by the Organization for Tropical Studies.
- 828 Conservation and Genetics**
 Fall of even years. 3(2-2) Interdepartmental with Fisheries and Wildlife and Zoology. Administered by Fisheries and Wildlife. RB: ZOL 341 or CSS 350 or ANS 314
 Population and evolutionary genetic principles applied to ecology, conservation, and management of fish and wildlife at the individual, population, and species level.
- 847 Advanced Mycology**
 Spring of even years. 4(2-4) Interdepartmental with Plant Pathology. Administered by Plant Pathology. RB: PLB 402 SA: BOT 847
 Systematics, identification, physiology, genetics, and molecular biology of plant pathogenic fungi.
- 849 Evolutionary Biology**
 Spring. 3(3-0) Interdepartmental with Zoology. Administered by Plant Biology. RB: ZOL 341 and (STT 422 or concurrently) SA: BOT 849
 Major conceptual, theoretical and empirical questions in evolutionary biology. Readings and lectures are synthesized in student discussions and papers.
- 851 Statistical Methods for Ecology and Evolution**
 Fall. 3(2-2) Interdepartmental with Zoology. Administered by Zoology. RB: (STT 814) or or an equivalent course.
 Statistical modeling and interpretation of biological data using computationally intensive methods for estimation and inference. General linear models, mixed and process models, and estimation strategies applied to students using their own data using the R language.
- 855 Molecular Evolution: Principles and Techniques**
 Fall of odd years. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics and Zoology. Administered by Zoology. RB: ZOL 341 or ZOL 445
 Current techniques used to characterize and compare genes and genomes. Genetic variation, assays of variation. Data analysis and computer use to conduct a phylogenetic analysis to compare organisms and infer relationships.
- 856 Plant Molecular and Omic Biology**
 Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology and Crop and Soil Sciences. Administered by Plant Biology. RB: ZOL 341 SA: BOT 856
 Recent advances in genetics and molecular biology of higher plants.
- 863 Environmental Plant Physiology**
 Spring of odd years. 3(3-0) Interdepartmental with Horticulture. Administered by Plant Biology. RB: PLB 301 or PLB 414 or PLB 415 SA: BOT 863
 Interaction of plant and environment. Photobiology, thermophysiology, and plant-water relations.
- 864 Plant Biochemistry**
 Fall. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology. Administered by Biochemistry and Molecular Biology. RB: (BMB 401 or BMB 462) and prior undergraduate course in plant physiology. SA: BCH 864
 Biochemistry unique to photosynthetic organisms. Photosynthetic and respiratory electron transport, nitrogen fixation, carbon dioxide fixation, lipid metabolism, carbon partitioning, cell walls, sulfur and nitrogen metabolism and specialized metabolism including isoprenoids, phenylpropanoids and alkaloids.
- 865 Plant Growth and Development**
 Fall of even years. 3(3-0) Interdepartmental with Horticulture. Administered by Plant Biology. RB: PLB 415 SA: BOT 865
 Genetics and biochemistry of development in higher plants as influenced by genes and environment. Biosynthesis, action and signal transduction of phytohormones and other signaling molecules. Patterning, meristem organization and formation of tissues and organs. Genetic mechanisms underlying developmental diversity.
- 884 Prokaryotic Diseases of Plants**
 Fall of even years. 3(3-0) Interdepartmental with Plant Pathology. Administered by Plant Pathology. RB: PLP 405 SA: BOT 884
 Prokaryotic genera associated with plant diseases. Genetics and host-pathogen interactions. Prokaryotic disease control strategies.
- 891 Current Topics in Ecology and Evolution**
 Summer. 1 to 2 credits. A student may earn a maximum of 10 credits in all enrollments for this course. Interdepartmental with Crop and Soil Sciences and Zoology. Administered by Zoology.
 Presentation and critical evaluation of theoretical and empirical developments in ecology and evolutionary biology by visiting scientists.
- 896 Population and Community Ecology**
 Fall. 4(4-0) Interdepartmental with Zoology. Administered by Zoology.
 Population dynamics of animals and plants utilizing life tables and projection matrices. Species interaction. Life history theory. Structure and dynamics of communities. Succession.
- 897 Ecosystem Ecology and Global Change**
 Spring of odd years. 4(4-0) Interdepartmental with Fisheries and Wildlife and Zoology. Administered by Zoology.
 Structure and function of natural ecosystems and their responses to global environmental change. Biogeochemical cycles, food webs, energy flow, nutrient cycling, and ecosystem management and restoration.
- 898 Population and Community Ecology Theory Laboratory**
 Fall. 1(0-3) Interdepartmental with Zoology. Administered by Plant Biology. RB: 1 semester of calculus
 Practical experience designing and analyzing mathematical models in ecology from single species to communities, food webs and ecosystems.
- 899 Master's Thesis Research**
 Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to graduate students. SA: BOT 899
 Research in anatomy, bryology cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, pathology, physiology and systematics.
- 999 Doctoral Dissertation Research**
 Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students. SA: BOT 999
 Research in anatomy, bryology cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, pathology, physiology and systematics.